Colonial Pipeline Company

Water Displacement Plan

INCIDENT: CR 91

LOCATION: Pelham, AL

DATE & TIME PREPARED: September 16, 2016 10:24 am

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	Sign	Print	Date
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LOSC:		John W. Wilder III	9/16/16
	Sign	Print	Date

***Please note**: All approved plans must be filed with the appropriate Documentation Unit Leader (DOCL) to upload into WebIAP as well as disseminated to proper ICS Staff and/or included in the Situation Display.

Colonial Pipeline Company

Water Displacement Plan

Line 01 Repair – CR 91 Event
Approximate Station 5153+78
DTN 59268

General Description

Approximately 880 barrels of product has been displaced with nitrogen between Stopples #1 and #2. Product remains in the low spots on the line and cannot be evacuated using the current nitrogen injection method. Revised plan is to displace the line with water using a foam displacer between the two stopples.

NOTE: This plan EXCLUDES safety-related information and evaluations. A job safety analysis (JSA) MUST be conducted and reviewed with all personnel prior to beginning work.

Water Displacement Plan

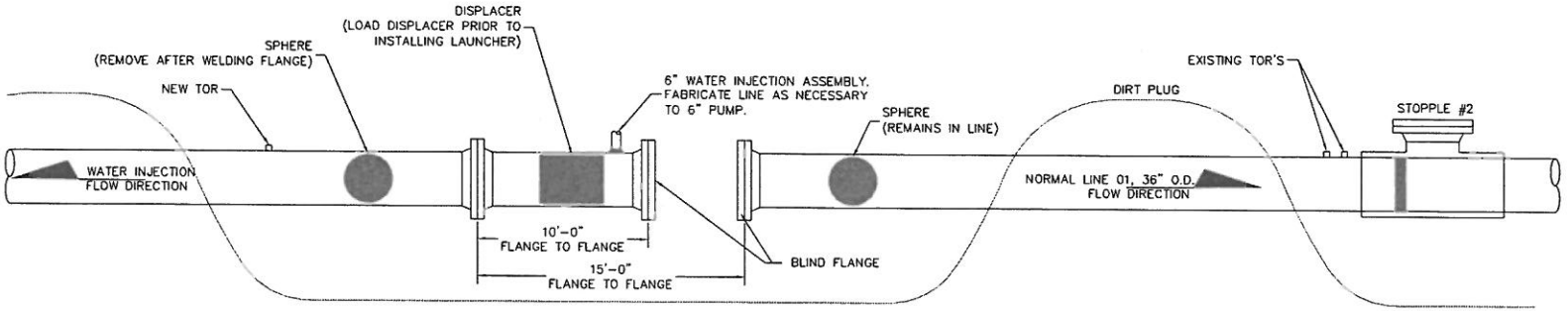
1. Construct a launcher consisting of 36" pipe, ANSI Class 300 flanges, a blind flange, and a 6" water injection assembly, including 6" ball valve. *Note that this launcher does NOT need to be hydrostatically tested since it will only be used to displace Line 01 with water between the two stopples. It will NOT be in place when Line 01 is returned to service.*
2. Fully excavate approximately 30 feet of Line 01 on the leak side of Stopple #2, leaving a dirt plug at least 10 feet long between the new excavation and the Stopple #2 excavation. Distance between Stopple #2 and the center of the new excavation should be approximately 55 feet. Install a TOR on the leak side of this excavation (approximately 70 feet away from Stopple #2) to use for venting during welding operations.
3. Stage ten (10) frac tanks at the Stopple #2 site and fill each with water using vacuum or tanker trucks from a municipal water source. Manifold as necessary from the frac tanks to a 6" pump.
4. Bleed existing pressure from Line 01 at the Stopple #1 and Stopple #2 sites. Pressure will be bled by taking product into vacuum trucks with scrubbers. Vacuum trucks will be sent to the Staging frac depot for measurement, tracking, and offloading.
5. After pressure is relieved at Stopple #2, evacuate all remaining product in the line by stinging through existing TORs until the line is empty at this site.
6. After verifying that all product has been evacuated out of Line 01 on the leak side of Stopple #2, cold cut approximately fifteen (15) feet out of Line 01 within the new excavation on the leak side of Stopple #2. *Reference JSA for safety measures to be taken during cold cut activities.*
7. Insert one sphere in Line 01 on each side of the cut and seal each with bentonite clay to prevent vapors from migrating from the pipeline into the cut area.
8. Weld a 36" ANSI Class 300 flange (WNRF or SORF) on each side of the cut according to Colonial welding procedure. On the Stopple #2 side of the cut, continuously sting any product that may bypass the stopple and continuously vent through the two TORs between the stopple and the new excavation. On the leak side of the cut, continuously vent through the TOR on the leak side of the cut. Venting will prevent pressure from building on either side of the cut, thereby preventing spheres from moving and clay seals from failing.
9. Install a blind flange on the flange on the Stopple #2 side of the cut. This will isolate the drain-up section from Stopple #2.
10. Install new batteries in a T2 transmitter and confirm that it is functioning. Install the transmitter in the displacer.
11. Load the displacer into the launcher.
12. Remove the sphere from the leak side of the cut and bolt the launcher to the flange on the leak side of the cut.

13. Install a pressure gauge on the TOR on the leak side of the launcher to monitor the pressure in the pipeline during the water displacement.
14. Connect the pump to the water injection assembly on the launcher. Inject water into the launcher to displace Line 01 between the two stopples. The initial target injection rate will be 3,600 gpm, which corresponds with a displacer speed of 1 foot/second. As nitrogen compresses in the pipeline, and as the displacer pushes product up the hills, the injection rate will be modified as necessary based on the flow conditions at Stopple #1. After the displacer passes the leak site, the flow rate may need to be increased significantly to keep the displacer moving. **Injection pressure should not exceed 20% of MOP, or 162 psig.**
15. During the injection, product and nitrogen will be received into vacuum trucks at Stopple #1. *Due to the presence of nitrogen in the line, flow into the vacuum trucks may be irregular and somewhat volatile. Ball valves at the TORs shall be manned continuously in case flow must be throttled or shut down completely. All hoses and connections shall be secured as necessary to prevent whipping and disconnection.*
16. When a vacuum truck is ¾ full, discontinue delivery into that truck. Prior to disconnecting the truck, apply a vacuum to the hose and ensure that hose is empty of product (clear the hose). Vacuum trucks will be sent to the Staging frac depot for measurement, tracking, and offloading.
17. If safe to do so, track the displacer throughout the displacement. Stop the water displacement when the displacer is approximately 50-100 feet away from Stopple #1.
18. Construct and hydrostatically test a flanged spool piece consisting of 36" pipe and ANSI Class 300 flanges. This spool piece will be installed in Line 01 on the leak side of Stopple #2 (where the launcher was located) after pipeline repair activities are complete.

Volume Calculations

The distance between Stopples #1 and #2 is approximately 3,000 feet. The volume in one linear foot of 36" pipe is approximately 1.2 barrels, so the total displacement volume between the two stopples is approximately 3,600 barrels, or 150,000 gallons.

After the displacement is complete, the line between Stopples #1 and #2 will be full of water. Assuming that the leak is at approximate Station 5153+78, the maximum volume of water that could possibly drain out of the leak site is approximately 2,000 barrels, or 84,000 gallons.


DISPLACER
(LOAD DISPLACER PRIOR TO
INSTALLING LAUNCHER)
SPHERE
(REMOVE AFTER WELDING FLANGE)
NEW TOR
6" WATER INJECTION ASSEMBLY.
FABRICATE LINE AS NECESSARY
TO 6" PUMP.
SPHERE
(REMAINS IN LINE)
EXISTING TOR'S
DIRT PLUG
STOPPLE #2
WATER INJECTION
FLOW DIRECTION
NORMAL LINE 01, 36" O.D.
FLOW DIRECTION
10'-0"
FLANGE TO FLANGE
15'-0"
FLANGE TO FLANGE
BLIND FLANGE